

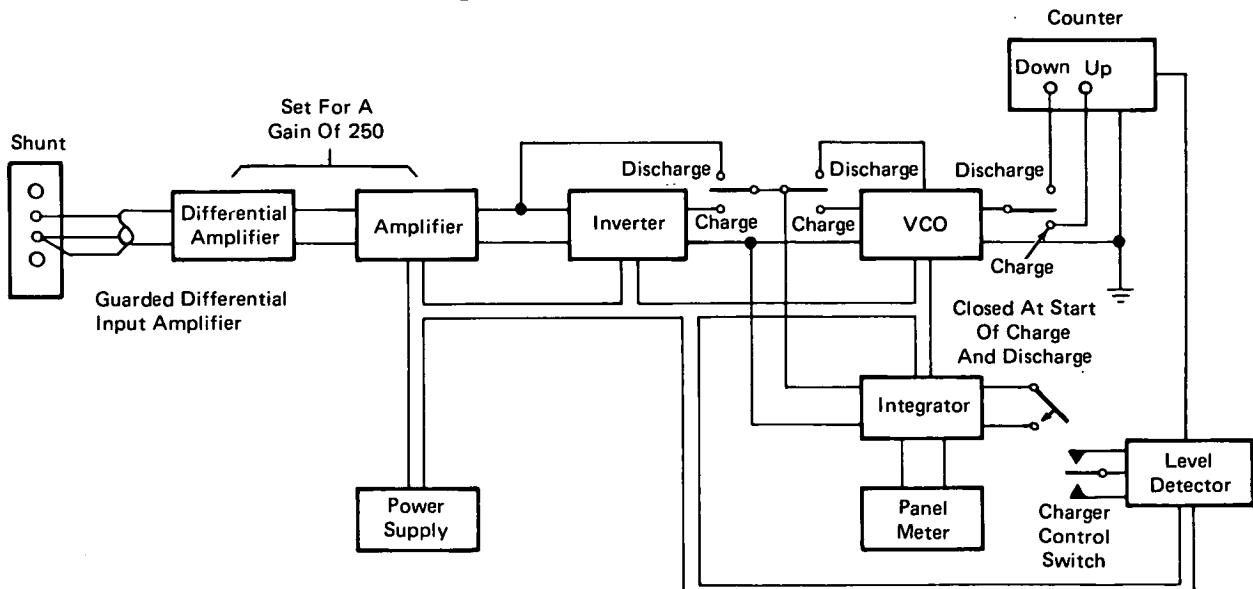
NASA TECH BRIEF

Marshall Space Flight Center



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An Ampere-Hour Meter For Batteries



The problem:

Rechargeable batteries are often tested for charge/discharge performance by battery manufacturers and users. An inconvenient part of this procedure is that it requires two unidirectional counters, one to record the ampere-hours charged and the other ampere-hours discharged.

The solution:

An up-down counter has been developed that records charge as well as discharge.

How it's done:

The system utilizes a reversible counter that is preset to indicate 100,000 counts, representing 100% charge for a 33 ampere-hour battery. The battery current passes through the meter shunt which provides one millivolt per ampere. The signal is then amplified to 0.250 volt per ampere by two amplifier circuits and is fed to a voltage-controlled oscillator (VCO). Frequency

of the voltage-controlled oscillator is set so that 100,000 counts correspond to 33 ampere-hours. A main programmer controller applies a load to the battery which connects the voltage-controlled oscillator output to the "down" input of the counter. As the battery discharges, the count total decreases, and at a preset time, determined by the programmer controller, the discharge phase of the battery is terminated.

In recharging the battery, the load is removed and a charger connected. The voltage-controlled oscillator input and output are switched to the charge positions with the oscillator output connected to the "up count" contact of the counter. As the battery is charged, the counter moves back to the 100,000 indication. In this case, the gain in the voltage-controlled circuit is lowered so that a larger number of ampere-hours are returned to the battery than removed. When the 100,000 count is reached, the level detector is activated by the binary-coded (BCD) output of the counter and the charger shuts down.

(continued overleaf)

Notes:

1. The counter may also be used where an accurate integration of any quantity is to be converted to an electrical analog.

2. Requests for further information may be directed to:

Technology Utilization Officer

Marshall Space Flight Center

Code A&PS-TU

Marshall Space Flight Center, Alabama 35812

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Patent status:

NASA has decided not to apply for a patent.

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